THIRTY-NINTH ANNUAL

# ORCHARD DAY

## *THURSDAY, AUGUST 3, 1961*

**The Buchholz Farm--New Horticultural Research Center**

OHIO AGRICULTURAL EXPERIMENT STATION

Wooster, Ohio

In Cooperation with

The Ohio State Horticultural Society

This page intentionally blank.

# CHEMICAL THINNING OF PEACHES

Robert G. Hill, Jr.
Dept. of Horticulture

For the early removal of part of the crop of developing fruits, peach thinning is essential to the production of regular crops of large, high quality peaches. This thinning operation is one of the major problems facing most peach growers due to its labor requirement and to the difficulty in completing the operation rapidly enough to gain its full benefit.

In an attempt to reduce the problems of peach thinning work has been in progress at the Ohio Agricultural Experiment Station and elsewhere designed to develop techniques whereby chemical means could be substituted for physical means for reducing the number of developing fruits. Results of these studies to date have indicated that chemical thinning procedures cannot be considered as the total answer to the peach thinning problem. In time, through continued research effort, chemical thinning methods may be developed which can be substituted entirely for physical means of solving this problem. At present, however, chemical thinning must be considered only as a labor saving device, a supplement to physical thinning methods, which will assist in the timely completion of operations.

Emphasis in these studies has been upon ascertaining the potential value of the various available thinning agents in reducing the thinning problem. These chemicals have been applied at different concentrations and at different stages in the development of the fruit. The value of these different treatments has been gauged by comparing the percent of developing fruits on test branches to that on test branches of comparable untreated trees and upon the characteristics of the fruits produced by the treated and untreated trees. Data has also been collected as to the effect of the chemicals upon the growth status of the trees and upon the bloom the season after treatment. Fruit samples have been supplied for residue analysis.

A number of different compounds of both caustic and hormone types have been tested. The caustic materials, such as Elgetol, to be effective must be applied at the time of full bloom. The application of such materials has been found to offer almost immediate reduction in the competition between developing fruits. These materials offer effective thinning and when used according to the manufacturer's recommendations can be used without the risk of undesirable residues. They have, however, only limited value in Ohio peach orchards since they must be applied before the crop is assured and are hazardous when applied on all except the most frost free sites.

The hormone type materials, such as NAA, NAM, NPA, and Chloro IPC have been found to offer thinning action later in the season, after the grower can be generally assured as to the crop status in his orchard. Good thinning results have been obtained during some season with all of these compounds. The results, with the exception of those obtained with NPA, have been variable and marked injury to the trees and crop have been noted as the result of their use.

This  page intentionally blank.

As a result of the Ohio studies NPA (n-1-naphthylphthalamic acid) which has been approved for such use by the Food & Drug Administration, is suggested for use by Ohio peach growers. Good results have been obtained when applied to the varieties Halehaven and Redhaven at the rate of 250-275 ppm, three to five days after full bloom. This scheme of application is suggested for grower use. Such applications have been found to significantly reduce the number of developing fruits within three weeks of treatment and to markedly reduce the labor required to complete the job of thinning.

Since the potential of NPA for thinning was established work has been continued in an attempt to remove some of the factors other than concentration in spray solution associated with its application which might account for variation in the thinning obtained from its use. Initial tests have indicated that one important source of variation is the gallonage of the spray material applied per tree. Excessive applications have been found to result in over thinning while light applications have not effectively thinned. Since most growers have, through experience, learned how much ordinary pesticide spray to apply per tree it is suggested that they use the same volume in applying the thinning spray. Special emphasis is now being placed upon developing a more precise gauge of their applications. Since seasonal temperature differences affect the rate of development of bloom and the fruit after bloom, an effort is being made to associate temperature summation with the best time of application.

Although NPA is the best thinning agent available at present, and is being used, it has a major limitation in as much as it needs to be applied relatively soon after bloom. A more ideal chemical thinning agent for the peach would be one which could be applied about two weeks after bloom and would give consistant thinning results without damage to the trees or crop. Work is continuing in an effort to locate and develop the technique of use of such a thinner. Until such a thinner is found growers are encouraged to consider the use of NPA as a way of minimizing the thinning problem in their orchards. It is suggested that they use it on a limited basis, however, until they have gained experience with it under their own orchard conditions.

This  page intentionally blank.

# EARLY SEASON CONTROL OF APPLE PESTS

C. R. Cutright
Dept. of Zoology and Entomology

"An ounce of prevention is worth a pound of cure" says the old adage and in the control of certain apple pests this is certainly true. Insects that fall in this category are the San Jose and other scales, the rosy apple aphid, the red-banded leaf roller, many leaf eating insects and, in some seasons, the plum curculio. Most important of all is early season control of the European red mite.

Let's consider some examples.

In the case of the San Jose scale, the oil sprays have proved their effectiveness over a long period of years. While this insect can be controlled with phosphate sprays, these must be timed carefully in contrast with the relatively simple matter of applying the oil spray at the beginning of the spray season.

The rosy aphis is not controlled perfectly by the oil spray but when materials such as the organo-phosphates, B.H.C. or Dinitro are added to oil excellent control may be secured. Also if sprays of organo-phosphates are used not later than the "pink" spray commercial control is assured.

In recent years it has been shown that control of first brood red-banded leaf roller may be obtained by adding organo-phosphates to oil sprays especially when these are applied in the delayed dormant period. Endrin is used effectively in the petal fall.

One of the best examples of successful early season use of spray chemicals is that involving the European red mite. To prevent and/or alleviate severe problems with this pest in mid-summer it is essential that some type of early season treatment be employed. Oil sprays are highly effective especially when we consider that no resistance to oil has appeared. The oils may be used in dormant, delayed dormant or even as late as the pink. Other materials are effective when used in the "pink" or both "pink" and "petal-fall". By reducing the early population of mites a far better chance of late season control is secured because other materials used later in the season do not have massive populations to overcome.

For example, an orchardist in Mahoning County this spring failed to cover all his orchard with oil. The untreated section received two covers of Guthion and the oil sprayed one Guthion spray. The result on June 29 was:

Oil plus one Guthion spray - 0 eggs per leaf.
No oil - two Guthion sprays - 12.5 eggs per leaf.

This shows the value of an effective early, preventative spray. In another orchard in the same area Mitox, used in the "pink", showed the same type of good control. Other effective materials used early will produce the same results.

This  page intentionally blank.

The Entomology section of the Snyder Orchard has been used entirely this year for early season experiments against the European red mite, the rosy aphis. and the red-banded leaf roller. There are 34 different schedules under test each of which is replicated four times, twice on Cortland and twice on Rome. All were applied either in the dormant, delayed dormant or the pink.

Unfortunately the infestation of red-banded leaf roller was very light and while more injury appeared on the check trees than on treated ones, the significance of these differences is doubtful.

There was a light infestation of rosy aphis, but the data indicate that definite control was secured by a number of materials. This is indicated in the table.

The European red mite experiment is still in progress but clear indications of control by certain materials are shown in the table.

This  page intentionally blank.

SOME EXAMPLES OF EUROPEAN RED MITE AND ROSY APHIS CONTROL
BY EARLY SEASON SPRAYS. 1961.

Ohio Agricultural Experiment Station
Wooster, Ohio

| | | Total Mites Per Leaf | Total Aphis Colonies |
|---|---|---|---|
| Check - no treatment for mites or aphids. | | 5.6 | 30 |
| DN - 289 - 1 quart - 100 gallons 4/14 | | .6 | 3 |
| Superior oil 2% 4/19 | | .3 | 2 |
| " " " + Diazinon 1# 4/19 | | .4 | 1 |
| " " " + Guthion E.C. 1 pint 4/19 | | .3 | 2 |
| " " " + B.H.C. 1# 4/19 | | .9 | 2 |
| Superior oil 1% | 5/10 | .0 | 10 |
| " " 2% | " | .0 | 21 |
| " " 1% + trithion F4 - ½ pint | " | .0 | 0 |
| " " 1% + Endrin 50W 1# | " | .0 | 7 |
| Polybutene 2 gallons - 100 | " | .T | 7 |
| " " " " | " & 5/24 | 0 | 7 |
| Exp. 1 (25) | " | .1 | 17 |
| " 2 (26) | " | 2.4 | 20 |
| " 3 (27) | " | 0 | 0 |
| " 4 (28) | " | T | 0 |
| " 5 (29) | " | .8 | 8 |
| " 6 (30) | " | .1 | 2 |
| " 7 (31) | " | .7 | 5 |
| " 8 (32) | " | 2.1 | 9 |
| " 9 (33) | " | T | 1 |

This  page intentionally blank.

# FRUIT DISEASE RESEARCH AT THE OHIO AGRICULTURAL EXPERIMENT STATION - 1961

H. F. Winter
Dept. of Botany and Plant Pathology

Fruit disease research in progress at the Ohio Agricultural Experiment Station and in outlying farms and commercial orchards at the present time might be catagorized under two main headings. One of these is research with fruit fungicides; their evaluation as to effectiveness in disease control, the detection of injurious effects of fungicides on the fruit crop being sprayed, and their adaptibility for use with various types of spray equipment. The other principal field of research is that dealing with the virus diseases of stone and pome fruits.

The fungicide research in progress now involves the evaluation of new fungicides as they are developed for the control of such diseases as apple scab, brown rot of peaches, plums, and cherries, cherry leaf spot, and black knot of plums. In addition, work is continuing in an attempt to find a better and cheaper way to control fireblight of apples and pears. Much of the fungicide and bactericide research is done in the Botany and Plant Pathology orchard at Wooster but commercial orchards in various parts of the state and orchards at the outlying experimental farms are also utilized freely. Stop No. 3 on the Orchard Day wagon tour is located in the Botany & Plant Pathology orchard. In this apple orchard and in the peach and plum orchards nearby, new fungicides and bactericides are being evaluated for control of apple scab, fireblight, and brown rot. The effect of fungicides on apple "fruit set" and yield is also being determined in this orchard. Preliminary results of the 1961 experiments will be viewed on the wagon tour. In addition to the work being done at Wooster, an apple scab test is being made at the Mahoning County Farm at Canfield, Ohio, a cherry leaf spot test is in progress at Bellvue, Ohio, and a plum black knot test is being made near Port Clinton, Ohio.

The tree fruit virus research is relatively new and much of the work is just being initiated. Preliminary investigation has revealed the presence of several latent viruses in apples. Their effects on the performance of apple trees is yet to be determined. The latent viruses do not cause readily detectible symptoms on common commercial apple varieties and their presence in such must be determined by the use of susceptible symptom-expressing indexing hosts. A so-called "virus nursery" has been established on the Snyder Farm at the Experiment Station and indexing hosts or trees are being assembled and increased in numbers. These will be used in future experiments. Surveys are presently being started to determine the prevalence and the importance of the virus diseases of apples in Ohio orchards.

Another experiment in progress in a cherry orchard near Clyde, Ohio, is designed to determine under Ohio conditions the effect of sour cherry yellows and ring spot viruses on the growth and yield of Montmorency cherries. This work is also just getting underway.

The results of fruit disease researchare reported to you at various county fruit meetings, at the Ohio State Horticultural Society meetings, at the annual Fruit School, in Farm and Home Research, and in other Station bulletins.

The fungicide and bactericide research furnishes the data which enables the Extension Service and the Station to annually revise and send out to you the various spray charts which contain the spray schedules.

This  page intentionally blank.

# PRELIMINARY RESULTS WITH INSECTICIDES AND ACARICIDES ON PEACHES AND PLUMS

Roy W. Rings
Dept. of Zoology and Entomology

## I. Initial Field Tests with New Materials Against Plum Curculio Infesting Plums.

This experiment is designed to discover safer and better insecticides for the control of the plum curculio. Although dieldrin gives almost perfect control of this pest this chemical has undesirable side effects on both peaches and plums in building up populations of European red mite. In addition dieldrin complicates the problem of oriental fruit moth control on peaches by effectively eliminating beneficial parasites. Parathion and EPN, while nearly as effective as dieldrin for curculio, are hazardous to use and must be applied with caution.

One of the most promising materials tested this year was a systemic phosphate (Niagara 5767) which gave a 98.9% reduction in larval populations when applied at the rate of one pound of 50% soluble powder in 100 gallons of water. Equally promising was a contact phosphorodithioate (Stauffer 1504) which gave a reduction of 98.4% at a dosage of 2 quarts in 100 gallons. Good control was obtained with a systemic carbamate (Zectran) but no control was secured with high viscosity butylene polymers.

## II. Field Tests on Peaches for Controlling Cat-Facing Insects.

This experiment is designed to control the cat-facing complex of insects which consists of the plum curculio, the tarnished plant bug, stink bugs, oak plant bug, and hickory plant bug. To date no one insecticide has been found which will control this diverse group of pests and even the best combinations of insecticides have not given adequate control of the oak and hickory plant bugs. New materials are tested each year for their effectiveness on cat-facing insects with the hope that a broad spectum material which has rapid knockdown properties, can be discovered. Data on this experiment will not be available until late August.

## III. Field Tests on the Control of European Red Mite, Two-Spotted Mite and Peach Silver Mite.

Field tests on mites are conducted in a one acre 11 year old Elberta peach block. This year tests are underway to evaluate a series of butylene polymers for mite control. These materials are sticky, viscous chemicals which kill by physical rather than chemical action and therefore it is believed that mites will not develop resistance to them. The method of killing has been shown to be by immobilizing mites, whereby they are unable to move about to feed or to reproduce. Polybutenes are being tested alone and in combination with chemical acaricides to determine if the residual properties of the chemical acaricide can be enhanced.

This  page intentionally blank.

# CHEMICAL THINNING OF APPLES

Clive W. Donoho, Jr., and Fred O. Hartman
Dept. of Horticulture

The high cost of labor and the premium price paid for large, high quality apples has made chemical fruit thinning a must for many Ohio apple growers. This practice, when properly used, will greatly reduce the time required for hand thinning and thus save the grower many dollars. All Ohio apple growers should seriously consider the incorporation of chemical thinning of apples as a standard practice in their production program.

## 1961 Chemical Thinning Experiments

The objectives of the 1961 thinning experiments were: (1) to further evaluate the chemicals currently used in Ohio for chemical thinning; (2) to study the influence of different application dates when using naphthaleneacetic acid (NAA) and napthaleneacetamide (Amide) under Ohio conditions; (3) to evaluate a new chemical, 4-thianaphtheneacetic acid (4-TNA) as a possible thinning agent for apples; and (4) to evaluate the insecticide Sevin as a chemical thinning agent. All thinning experiments and results reported herein were carried out in the thinning orchard located at the Buchholz Farm, Wooster, Ohio. Seven-year-old Jonathan apple trees were used in these studies. The results are summarized as follows:

1. In evaluating the thinning chemicals currently used in Ohio it was found that NAA 10 ppm, Amide 50 ppm, and NAA 5 ppm + Tween-20 all removed about the same amount of fruit from the Jonathan trees. All effectively removed a large portion of the excess fruit and when supplemented with a small amount of hand thinning, a very desirable crop was obtained. DN-1 used at the rate of 10 oz. per 100 gallons of water and applied when 50 to 75 percent of the Jonathan blossom had opened, slightly overthinned some trees, but in general a very desirable size crop was obtained.

2. In evaluating the effective dates of application when using NAA or Amide, it was found that both NAA 10 ppm and Amide 50 ppm caused the greatest drop of fruit when the materials were applied after the largest fruit on the tree has reached a length of nearly $\frac{1}{2}$ inches (17 mm) or 16 days after petal fall. (Table I). Some trees were overthinned by these treatments. It is still recommended that both NAA and Amide be applied within one week after petal fall since fruit growth may be slowed down by the late treatments.

3. A new compound, 4-thianaphtheneacetic acid (4-TNA) was found to be as effective as NAA and Amide in removing excess fruit when used at 15 ppm concentration and when applied four days after petal fall. (Table I). These results are encouraging since this is the first time this compound has ever been evaluated for this purpose. Timing, concentration, and many other factors have yet to be worked out to determine if this compound will have any superior qualities over NAA and Amide. Even if further experiments prove favorable it will be several years before clearance can be given and the compound offered for commercial use.

This  page intentionally blank.

TABLE I Results of Chemical Thinning of Apples - 1961
Buchholz Orchard
7-year-old Jonathan

| Treatment | Concentration | No. of Trees in Each Treatment | Time of Chemical Application | | Ave. Length of Largest Fruit (mm) | No. of Fruit 100 Blossom Clusters |
|---|---|---|---|---|---|---|
| | | | Days After Blossoms Open | Days After Petal-Fall | | |
| Not Thinned | | 16 | | | | 41 |
| D.N. - 1 | 10 oz./100 gal. water | 12 | Full Bloom Spray | | | 13 |
| NAA | 10 ppm | 6 | 7 | | 5.0 | 25 |
| Amide | 50 ppm | 6 | 7 | | 5.0 | 26 |
| Sevin | 2 lbs/100 gal. water | 10 | 9 | Petal-Fall Spray | 6.0 | 2 |
| NAA | 10 ppm | 12 | 13 | 4 | 7.0 | 27 |
| Amide | 50 ppm | 12 | 13 | 4 | 7.0 | 27 |
| NAA + Tween-20 | 5 ppm | 12 | 13 | 4 | 7.0 | 28 |
| 4-TNA | 5 ppm | 8 | 13 | 4 | 7.0 | 39 |
| 4-TNA | 10 ppm | 8 | 13 | 4 | 7.0 | 34 |
| 4-TNA | 15 ppm | 8 | 13 | 4 | 7.0 | 27 |
| NAA | 10 ppm | 6 | 17 | 9 | 12.0 | 30 |
| Amide | 50 ppm | 6 | 17 | 9 | 12.0 | 26 |
| NAA | 10 ppm | 6 | 24 | 16 | 17.0 | 13 |
| Amide | 50 ppm | 6 | 24 | 16 | 17.0 | 16 |

This  page intentionally blank.

4. Sevin so drastically reduced the crop of apples on seven-year-old Jonathan trees, (Table I) that it is strongly recommended that the material not used as a fruit thinning agent on trees younger than 10 years old. Visual observations revealed that it severely reduced the crop of fruit on seven-year-old Rome, Melrose, Ruby, Crandall, and Ida Red when used as a thinning agent and applied at petal fall. Tests in other areas of the country have indicated that Sevin will do a desirable job of thinning mature Jonathan, McIntosh and Delicious but since little reaearch has been conducted in Ohio on older trees, it cannot be presently recommended. Work will be continued in evaluating its potential for thinning purposes in Ohio.

In view of results obtained in 1961 and previously, information is presented in Table II and the text which following that will serve as a guide to the use of thinning sprays by growers.

TABLE II Thinning Spray Guide - 1962

Thinning Guide For Apples

| Variety | Material per 100 gallons | Time to Apply |
|---|---|---|
| Yellow Transparent<br>Duchess<br>Wealthy | D.N. 1 - 16 oz.<br>Amide - 60 ppm | At full bloom (75-80% blossoms open) |
| Grimes Golden<br>Rome Beauty<br>Golden Delicious | NAA - 15 to 20 ppm<br>or<br>Amide - 60 ppm<br>or<br>D.N. 1 - 10 oz. | Within one week after 80% petals have fallen<br><br><br>Full bloom |
| Jonathan<br>McIntosh | NAA - 8 to 10 ppm<br>or<br>Amide - 50 ppm | Within one week after 80% of petals have fallen |
| Delicious<br>Stayman | Chemical thinning is a hazardous procedure with these two varieties. Possibly NAA at 8 to 10 ppm may be used under the most favorable fruit setting conditions. Such an application should be made within one week after 80% of the petals have fallen. Previous experience of the grower must be the chief consideration in chemical thinning these two varieties. | |

Thinning sprays should be applied promptly within the time limits designated above. A single application of any given material is recommended. A repeat application is not ordinarily justified and sometimes may do more harm than good by being applied too late.

Each grower must keep careful records of weather and growing conditions each year at thinning time. These are essential in evaluating the results of any given thinning spray. Check trees should always be left for comparison of results. The effectiveness of any chemical thinning program depends upon how well the grower keeps records and interprets results each year in light of variations

This  page intentionally blank.

in environment. For example, whenever unfavorable conditions exist which would tend to increase the amount of thinning, the concentration of chemical should be reduced to the lower limit in Table I. If weather conditions are cloudy, damp and cool or if near freezing temperatures occur, it may be wise to delay the thinning spray for 2 or 3 days until more favorable conditions exist. Chemical thinning, like all other successful orchard operations, requires experience and the only way to gain this experience is by trial in ones own regular production program.

This  page intentionally blank.

# SIZE CONTROLLING STOCKS FOR THE APPLE

Freeman S. Howlett
Dept. of Horticulture

The two most commonly used size controlling stocks for the apple are Malling IX and Malling VII. Malling IX produces very dwarf trees while Malling VII results in semi-dwarf trees one-half or more of the size attained by trees on non-dwarfing apple seedlings. Each of these rootstocks has been shown to possess several important advantages and disadvantages. Malling IX bears within one or two years of planting but the trees are still very small and the yield is proportionately low. Malling VII usually has borne at Wooster four years from planting. The trees tend to attain greater size in proportion to standard non-dwarfed ones than is desired. Both stocks have resulted in greater yields per acre than are obtained with trees on non-dwarfing stocks. This is largely due to the greater number of trees per acre as a result of the closer planting distances.

## Objectives of the Experimental Work in the Buchholz Orchard

Malling IX - This particular block of trees was established primarily to ascertain whether flower removal during one or more years immediately following planting would significantly increase tree size and eventually result in greater fruit production. Dwarfing is presumed to be due directly to the inherent nature of the stock as well as indirectly to the exhaustiveness of such very early fruiting. Possibly if fruiting is somewhat delayed increased size of tree might compensate for the fruits eliminated while the trees are very small.

Three plantings of apple trees on Malling IX rootstock were made at the Buchholz Farm during the period from 1956 and 1957 as follows: Jonathan in May 1956, and Golden Delicious and "Double Red" Delicious in 1957. The planting distance is 10' by 18'. The Jonathan trees bore fruit in 1958 and the other two varieties in 1959. The average tree circumference and yields for Jonathan only are presented in Table 1. The following results have been obtained to date:

1. Removal of the flowers for one year only has not significantly increased tree size as measured by increases in tree circumference.

2. Removal of flowers for two and three years has resulted in a small increase in tree size.

3. Since relatively few flowers and fruits were produced during the first two years, 1958 and 1959, their removal resulted in little fruit reduction for the three year bearing period.

4. Apparently the repressive effects of fruit bearing upon growth are greater the more extensive is the flowering and fruiting.

5. The extent of dwarfing induced by Malling IX rootstock is definitely affected by early production even though the amount of dwarfing was less than expected.

This  page intentionally blank.

TABLE 1 GROWTH AND YIELD OF JONATHAN APPLE TREES ON MALLING IX TREES PLANTED 1956, BUCHHOLZ ORCHARD

| Treatment | Average tree circumference-1961 inches | Ratio in % | Average accumulated weight fruit per tree pounds | Average accumulated yield per acre* bushels |
|---|---|---|---|---|
| 1. No flowers removed any year | 4.32 | 100.0 | 14.0 | 70 |
| 2. Flowers removed 1958 only | 4.47 | 103.5 | 16.7 | 90 |
| 3. Flowers removed 1959 only | 4.42 | 102.3 | 12.2 | 62 |
| 4. Flowers removed 1960 only | 4.21 | 97.5 | 6.0 | 28 |
| 5. Flowers removed 1958 and 1959 | 4.54 | 105.1 | 11.0 | 55 |
| 6. Flowers removed 1958, 1959, 1960 | 4.66 | 107.9 | 0.0 | 0 |
| 7. Flowers removed 1958, 1959, 1960, 1961 | 4.78 | 110.6 | 0.0 | 0 |
| 8. Flowers removed 1958 and 1960 Left on 1959 and 1961 | 4.51 | 104.4 | 6.7 | 34 |

* Based on 10' by 18' planting distance
242 trees per acre

This  page intentionally blank.

6. The effect of flower removal for two or three years upon subsequent bearing has yet to be ascertained.

7. Apart from the effect of flower removal, it should be noted that the Jonathan trees allowed to bear since planting have an accumulated yield for the four year period of 70 bushels per acre.

Malling VII - Several apple varieties propagated on Malling VII were planted in 1955 in the Buchholz Orchard. These trees bore their first fruits in 1958. The total yield each year as well as the accumulated total yield per tree and average yield per acre are presented in Table 2. The principal results to be noted are as follows:

1. Gallia Beauty, Golden Delicious, and Ruby were the first varieties to come into bearing while Starking showed the greatest delay.

2. The greatest accumulated total yield per tree at the end of the first three bearing years was obtained in Golden Delicious followed by Blaxtayman 201, Ruby, and Melrose. Starking had a much lower total yield than any variety.

3. Calculated on the basis of 77 trees per acre the average accumulated yield for these four varieties ranged from 105 to 135 bushels per acre.

Hardy Intermediate Stocks for the Apple

Apple varieties differ considerably in the resistance of their trunks and main body framework to low temperature injury. These portions of the tree are the last to mature in the fall and as a result rapid drops in temperature during late November and early December may be conducive to bark injury and bark splitting. During the late fall of 1958 two trees of the uncommon variety Lowry were badly injured and were subsequently removed. Several of the varieties of major commercial importance in Ohio have been shown by artificial freezing tests to be particularly susceptible to injury. Among these are: Delicious (and its mutations), Stayman Winesap (and its mutations), Gallia Beauty, Rome Beauty, and Golden Delicious. At the Mahoning County Farm, Jonathan and Gallia Beauty were topworked on 18 hardy intermediate stocks (varieties) and at the Buchholz Farm Richared and Ruby have been established on 11 stocks of Canadian or Russian origin. The planting is not yet of sufficient age to ascertain the effects of each of the various hardy varieties upon the growth and fruiting of Richared and Ruby.

At the Mahoning County Farm certain hardy varieties such as: Kulon Kitaika, Columbia, and Manitof have been superior to Hibernal for Jonathan while Columbia, Noir de Vitry and Manitof have given higher yields than Hibernal for Gallia Beauty. Apparently varietal differences exist in the suitability of hardy stocks for standard apple varieties. The major point seems to be that other hardy varieties are superior to Hibernal as an intermediate stock for the apple. Among these are: Kulon Kitaika and Columbia. Columbia is one of the most hardy of all varieties.

This  page intentionally blank.

TABLE 2 YIELD OF TREES OF SEVERAL VARIETIES UPON MALLING VII SEMI-DWARFING ROOTSTOCK, 1955-1960

Trees Planted 1955 Buchholz Farm

| Variety | No. of trees | Annual Yield in Pounds 1958 | 1959 | 1960 | Accumulated yield total (pounds) | per tree (pounds) | Average accumulated yield per acre * (bushels) |
|---|---|---|---|---|---|---|---|
| Blaxtayman 201 | 27 | 1 | 304 | 1585 | 1890 | 70.0 | 112 |
| Gallia Beauty | 29 | 46 | 496 | 950 | 1492 | 51.4 | 82 |
| Golden Delicious | 29 | 58 | 335 | 2041 | 2434 | 83.9 | 135 |
| Melrose | 30 | 1 | 103 | 1877 | 1981 | 66.0 | 105 |
| Ruby | 28 | 25 | 567 | 1341 | 1933 | 69.0 | 111 |
| Starking | 30 | | 4 | 1194 | 1198 | 39.9 | 64 |

* Based on 22.5' by 25' planting distance
77 trees per acre

This  page intentionally blank.

# APPLE NUTRITION STUDIES

James M. Beattie
Dept. of Horticulture

For many years apple growers have relied on the use of nitrogen only in the orchard fertilizer program. Frequently, it was the only nutrient element which could be expected to give response. More recently, however, other essential elements have been found deficient including magnesium, potassium, manganese, and boron. Of these, deficiencies of potassium are the most common and recent experiments at Wooster have shown the yield and color of Rome Beauty apple fruits to be improved by potash applications when the leaf content of this element fell below a certain level.

In the principal apple growing regions of the eastern United States it has never been possible to demonstrate a direct tree response to field applications of phosphorus. This cannot be interpreted to mean that phosphorus is not needed by apple or other fruit trees, only that these particular plants have been able to absorb adequate amounts of this element according to any index of deficiency which we have to date used.

With these factors as a background, experimental work is being conducted in the Nutrition Orchard located at the Buchholz Farm with the following objectives:

1. To determine the influence of different rates and combinations of nitrogen, phosphorus, and potassium fertilizers on the growth, chemical composition and productivity of a newly established apple orchard.

2. To further refine the requirements of the apple for these three major nutrient elements as related to leaf composition, yield, and fruit quality.

3. To study the interrelationship of nitrogen, phosphorus, and potassium fertilization of the apple so as to provide an accurate basis for recommendation of fertilizer application to fruit growers.

This orchard, comprising nearly 10 acres, was planted in the spring of 1955. The planting consists of 19 rows running east and west with 25 trees in each row. The trees are set 30 feet apart on the square system and are on seedling roots. The principal varieties in the planting are Rome Beauty (Rows 2, 5, 8, 11, 14, and 17) and Jonathan (Rows 3, 6, 9, 12, 15, and 18). The remaining seven rows are planted with a different variety in each row as follows: Row 1 - Melrose, Row 4 - Franklin, Row 7 - Ruby, Row 10 - Monroe, Row 13 - Crandall, Row 16 - Gallia Beauty, and Row 19 - Idared. By utilizing the even numbered trees in each Rome Beauty and Jonathan row for nutritional experiments and by using the variety rows to separate the Rome and Jonathan rows, there are 72 plots consisting of one tree each of Rome Beauty and Jonathan. Each of these plots is surrounded by trees which do not receive differential fertilizer treatment.

The differential treatments consist of two levels on nitrogen, none plus two levels of phosphorus and none plus one rate of potassium fertilization singly and in all possible combinations. This factorial design provides 12

This  page intentionally blank.

different combinations of treatments which, within the 72 plots available, are repeated six times each. The different rates of nitrogen, phosphorus, and potassium application and their designations are given below:

1N - 1/8 lb. ammonium nitrate per year of tree age.
2N - 1/4 lb. ammonium nitrate per year of tree age.
0 P - No phosphorus applied.
1 P - 1/2 lb. of 20 percent superphosphate per year of tree age.
2 P - 1 lb. of 20 percent superphosphate per year of tree age.
0 K - No potassium applied.
1 K - 1/4 lb. of potassium sulphate per year of tree age.

Differential treatments were begun in the spring of 1957 and applications have been repeated during April of each year.

In this work one of the primary reasons for emphasizing phosphorus to the extent of including two levels of application plus a no phosphorus treatment is to learn if under different regimes with respect to nitrogen and potassium it will be possible to show a response to phosphorus and to further examine various aspects of fruit quality which may be affected by phosphorus and which have not heretofore been evaluated.

The nature of this type of experimentation dictates a long term study before definite results can be shown. The trees under treatment have borne some fruit for the past two years but as yet the yields are hardly significant. Certain trends in terms of tree response are showing up even at this relatively early date in the life of this orchard experiment and these are as follows:

1. Increasing nitrogen application has resulted in decreased leaf phosphorus and potassium with both varieties. It has shown a tendency, not yet statistically significant, to be associated with increased yields with both Jonathan and Rome Beauty.

2. Increased phosphorus application has resulted in increased leaf phosphorus but with no noticeable effect on trunk circumference, shoot growth, or yield.

3. Potassium application is associated with increased leaf K and decreased leaf Mg. It also showed a tendency to result in increased leaf Mn, decreased leaf B, and improved yield in both varieties but the differences were not significant.

This  page intentionally blank.

This page intentionally blank.

This page intentionally blank.